

ENVIRONMENTAL PROTECTION

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DEVELOPMENT OF ENVIRONMENT MANAGEMENT SYSTEM AT A GLASS FACTORY

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A method for the development of an environment management system using the process-oriented approach is considered taking the Borskii Refractory Works as example.

The ecological effectiveness of a company is acquiring increasing significance. Various companies are interested in attaining sufficient environmental effectiveness and controlling the impact of its activity, products, or services on the environment, taking into account the ecological policy and environmental target parameters [1]. A environmental management system (EMS) is an instrument for attaining high environmental efficiency of the company. The main purpose of the EMS is to support activities intended to protect the ambient medium and prevent its contamination, while preserving a balance with the company interests. The implementation of the EMS ensures the order and consistency of solving environmental problems by means of distributing resources and responsibilities and by constant monitoring of methods, procedures, and processes [2].

International standards ISO, series 14,000 extending to environment management are intended to equip producers with the elements of an efficient environment management system and prescribe certain procedures, corresponding documents, and personnel to be responsible for certain activities. The standard implies a combination of the EMS, the quality management system, and the general company control system. The latest version is ISO 14001:1996, its domestic analog is GOST R ISO 14001–98.

The Borskii Glass Works has vast traditions in environmental protection. The company management considers its main goal to ensure strict compliance with the legislative and regulatory norms for environmental protection. Lately Borskii Glass Works has implemented a number of environmental-protection measures; new purification facilities providing for a circulating water-supply system have been put

into service, which enables the company to decrease the volume of water taken from the river or discharge into the river; a dumping ground for industrial waste has been put into service, while the old dumping ground has been successfully re-cultivated; utilizing boilers are installed in smoke funnels to recover the heat generated by waste gasses from the glass-melting furnaces; contemporary highly efficient dust-recovery devices are used in batch preparation; the aspiration systems have been reconstructed; the emission of toxic components in air has decreased by modifying the batch composition for producing polished glass and by stricter compliance with technological procedures [3].

However, the company management believes these measures insufficient to be sure of the environment-related components of the production meeting the requirements of the society and the law and the production being economically effective. That is why the development of the environment management system (EMS) for the Borskii Glass Works was set as a target with respect to the production of sheet glass, glass preforms for car windows and mirrors, and laminated and hardened glass for the car industry, in accordance with the requirements of GOST R ISO 14001–98.

The development and the implementation of the EMS is a sufficiently complicated problem. Standard GOST R ISO 14001–98 recommends using the model of the environment management system based on the process-oriented approach. The process model of EMS provides an understanding on how the EMS should function in the context of system analysis, identify errors and weak spots, formulate proposals for improving processes, and achieve the target parameters related to the environment.

For an adequate representation of the processes in the environment management system we use functional modeling,

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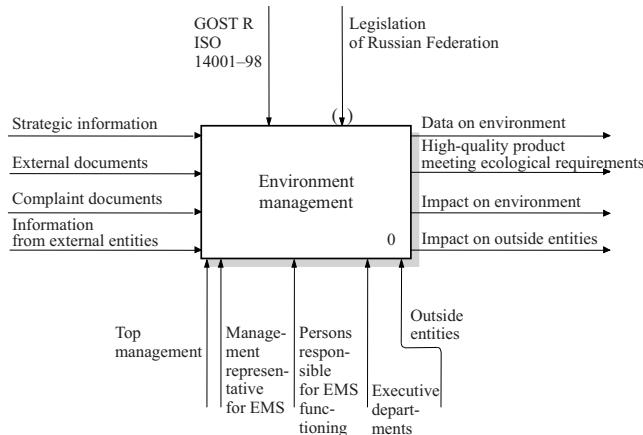


Fig. 1. Context diagram of environment management system.

i.e., methods and program instruments for the description and analysis of the processes, which makes it possible to represent diverse EMS processes as a set of diagrams mapping the functions performed and relating their material and information flows and required resources.

The EMS model was developed using the wide known method of system modeling and design, namely IDEF0 (P50.1.028–2001. Information technologies for supporting product life cycle. Functional modeling methods). This model includes a set of diagrams and text description. The diagrams were developed using BPwin, i.e., a CAD tool for information system.

The position of the EMS and its relations with the ambient medium are shown in context diagram A-0 (Fig. 1).

Using data metatypes and functional groups, a diagram of the upper level A-0 was created (Fig. 2), which is a decomposition of A-0. It reflects the main EMS process:

- A1) manage resources;
- A2) implement the responsibility of top management;
- A3) manage documents;
- A4) implement processes of product life cycles;
- A5) measure, analyze, and improve.

Each block of the upper level diagram can be represented as a separate block consisting of blocks and arcs. For instance, block A2 “Implement the responsibility of the top management” after decomposition includes the following blocks (Fig. 3):

- A21) guarantee the fulfillment of customers' requirements and environmental protection;
- A22) define the ecological policy of the EMS;
- A23) plan the EMS;
- A24) distribute responsibilities and authority, ensure information exchange;
- A25) implement analysis by the top management.

Next, blocks A21 – A25 were decomposed into other diagrams until the simplest processes were obtained.

After the verification of the process EMS model carried out by the author and the elimination of its drawbacks, the impact of each process on the efficiency of the EMS system was analyzed. Next, the diagrams were evaluated by experts, namely, the heads of departments and specialists of the

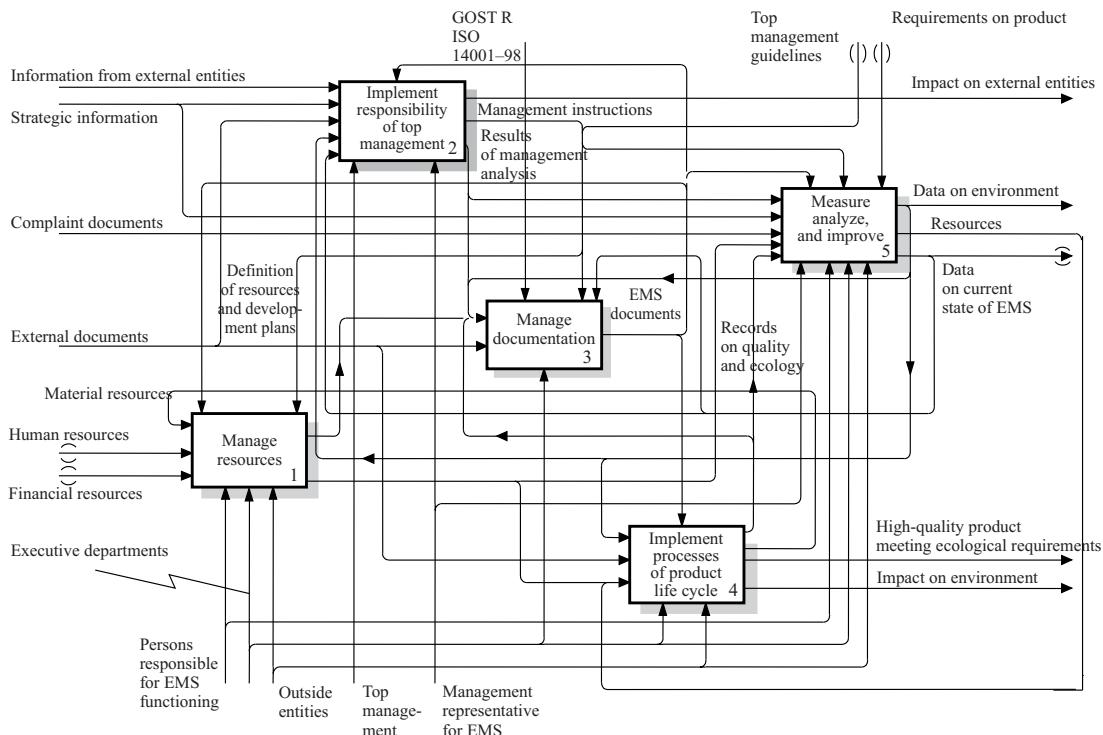


Fig. 2. Diagram of decomposition of the environment management system.

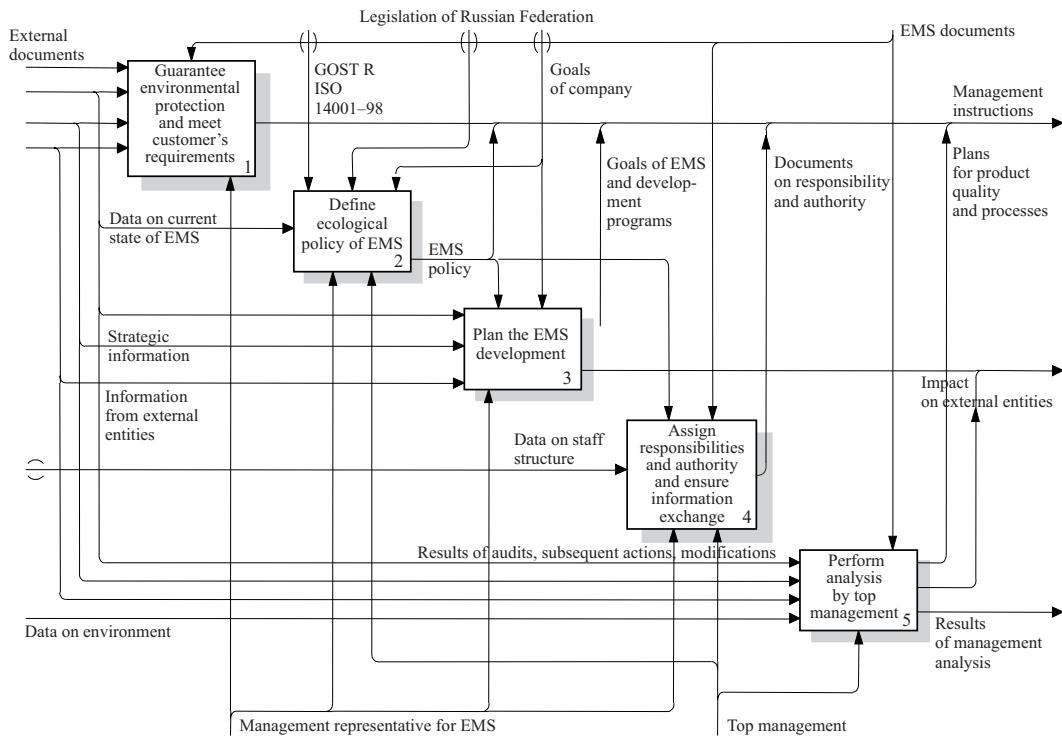


Fig. 3. Diagram of decomposition of the process "Implement the responsibility of top management".

Borskii Glass Works. The developed and approved model was used to create the company environment management system, which in December 2003 was certified to satisfy the requirements of GOST R ISO 14001-98.

The existence of a certified EMS gives advantages to the company in getting orders and diminishes the risk of a poor-quality product not complying with environmental requirements. The existing environment management system of the Borskii Glass Works makes it possible to relate the environmental and production target indexes of the company to particular financial results and thus to guarantee the optimum use of resources both in the financial and ecological aspects.

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